19980930.ba v02_n237.bam.980930

>From ???@??? Thu Oct 01 06:42:37 1998
Message-Id: <199809301411.JAA27575@sco.theporch.com>
Date: Wed, 30 Sep 1998 09:10:39 CDT
Subject: BOATANCHORS digest 2237

BOATANCHORS Digest 2237

Topics covered in this issue include:

1) Re: Ground question
by "Roberta J. Barmore" <rbarmore@indy.net>
2) Re: Ground question
by Sandy W5TVW <ebjr@worldnet.att.net>
3) Re: more RS-6 speculation
by Kargokult@aol.com
4) Re: Ground question
by Bob Roehrig <broehrig@admin.aurora.edu>
5) Grounds, BC industry
by polepeeg@aa4rm.ba-watch.org (Marty's Refl. Drop)
6) corrections - Grounds, BC industry
by polepeeg@aa4rm.ba-watch.org (Marty's Refl. Drop)
7) Re: more RS-6 speculation
by polepeeg@aa4rm.ba-watch.org (Marty's Refl. Drop)
8) Ameco Converter?
by gcr2@po.CWRU.Edu (George C. Rybicki)
9) US Army Closes ALL public web sites.....
by Tom Norris <badger@telalink.net>
10) Re: US Army Closes ALL public web sites.....
by "JOSE V. GAVILA (EB5AGV/EC5AAU)" <eb5agv@ctv.es>
11) Help ID a Cardwell P/N, please...
by "Herbert M. Rosenthal" <herbrose@lobo.net>
12) FS: TV-7/A/B/D data
by JONWEINER@aol.com
13) Wanted: 3B28's
by "ROBERT F. KEMP" <rkemp@mr.net>
14) FS: Collins Literature
by JONWEINER@aol.com
15) Gonset Gooney Bird parts?
by "Thomas A. Adams" <103360.2133@compuserve.com>
16) Re: Ground question
by "Roberta J. Barmore" <rbarmore@indy.net>

Date: Tue, 29 Sep 1998 21:18:55 -0500 (EST)
From: "Roberta J. Barmore" <rbarmore@indy.net>
To: Old Tube Radios <boatanchors@theporch.com>

cc: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Ground question
Message-ID: <Pine.SUN.3.96.980929210547.23936A-100000@indy2>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

Hi!

On Tue, 29 Sep 1998 CARRJJ@aol.com wrote:

> But try finding copper flashing strip (or even aluminum). [...]

Maybe so--which is why I mentioned nice fat stranded wire and soft-drawn copper tubing. You can pick up scraps of the first at a big construction site, if you ask nice, and the second can be found at most any large hardware store.

Now copper strap (as opposed to foil) is a bit of a drug on the market for me at work--seems like every rig we buy comes with a roll of it (sorry, gang, I don't have *huge* lots of it and it's on the inventory!). I'd try a big electrical supply house; I know they stock nice tapped ground bars, as we just bought three little ones (2" x 1/8" x 84") for the DTV project racks. Strap (as opposed to bar) is somewhere between 1/16" and 1/32" thick, closer to the bigger number, and available in many widths. 4" is considered adequate for many commercial broadcast applications--I have never seen it get cooked by lighting, even at AM stations where we had some big zaps. Costs like the very dickens, but if you measure carefully and buy it by the inch it's probably not totally dire; 2" strap would do for most hamshacks.

When we speak of grounds and grounding, bear in mind that "ground" serves many purposes. The big three are A) Electrical saftey ground B) RF ground and C) lighting ground. Ideally, you think the system through so the RF gets a nice good ground, the electrical code is satisfied, and the lightning has a path that does *not* go through your ham gear or the electrical wiring and panel. Some folks believe in a fourth purpose, that ground is a great big infinite sink that sucks in all the noise; this canard is an article religious faith rather than fact, and as I don't discuss religion on the air or the 'net, I'll just leave it be.

73,
--Bobbi

Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"
To: Old Tube Radios <boatanchors@theporch.com>
From: Sandy W5TVW <ebjr@worldnet.att.net>
Subject: Re: Ground question

Message-Id: <19980930030353.KNGO2580@LOCALNAME>
Date: Wed, 30 Sep 1998 03:03:53 +0000

At 05:09 PM 9/29/98 -0700, you wrote:
>Yes, it's common knowledge amongst this collegial group that larger and
>flatter conductors have less inductance per unit of length than a single
>cylindrical conductor. My concern is the impulse current (lightening
>strike) carrying capacity of foil. Seems to me that the small cross
>sectional area of a foil (or thin sheet) would have such a high thermal
>resistance that it may vaporize under a few thousand amp surge. I would
>check the NEC requirements for lightening grounds (maybe Polyphasor has the
>dope in their book). I would double up a foil grounding system with some
>fat amperage carrying solid (or stranded) conductors. Paralleling lots of
>wires in a screen like arrangement works well to lower inductance, but as
>someone mentioned you need lots of ground rods. Has anyone had experience
>with an insurance company not paying a claim because of poor grounding
>which failed to prevent a fire?
>
>Arden Allen   KB6NAX   Vallejo, CA   gumbear@pacbell.net
>

The strapping I commonly use is 0.015" or about 0.4 mm. thick and 2" wide.

Terman in "Radio Engineer's Handbook" 1943 Edn. states that generally a flat ribbon has a lower resistance ratio than a solid round wire of the same cross section. If the ribbon is formed into a tube, the tubular conductor has a slightly lower resistance ratio than the strip. This gives rise to the desirable reasons for using copper tubing rather than solid or stranded copper wire of the same outside diameter. The ratio can be determined by a chart on page 33.

I have found that the strip is very convienant to use vs. copper tubing. Although copper tubing is more readily available, especially the soft drawn refrigeration tubing which is easily bent and shaped. Nearly any decent hardware store will stock rolls of it in various sizes.

None of the texts I have mention anything about lightning prrotection. I'm sure Bobbi Barmore would be more familiar with what the broadcast industry uses and how it's used. I have seen some peculiar looking skeleton "mushrooms" atop towers that have something to do with improved lightning protection. I've never dealt to any extent with tall towers and the protection that they require.

73,
Sandy W5TVW

From: Kargokult@aol.com
Message-ID: <25297916.3611a2cc@aol.com>
Date: Tue, 29 Sep 1998 23:17:32 EDT
To: Old Tube Radios <boatanchors@theporch.com>
Mime-Version: 1.0

Subject: Re: more RS-6 speculation
Content-type: text/plain; charset=US-ASCII
Content-transfer-encoding: 7bit

this was messaged to me, repeated here for interest:

> An observation I have made on the RS-6 is:......It is my belief that MOTOROLA, although not being a known builder, I believe had a developmental hand in it....why?....as you search thru the parts section of the early manuals...one sees a similarity in the parts numbering systems and Motorola numbers "of the day" . i.e. Motorola's two-way business. Coincidence?..

--- hue miller

Date: Tue, 29 Sep 1998 22:40:36 -0500 (CDT)
From: Bob Roehrig <broehrig@admin.aurora.edu>
To: Old Tube Radios <boatanchors@theporch.com>
cc: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Ground question
Message-ID: <Pine.ULT.3.96.980929221707.25325A-100000@admin.aurora.edu>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

On Wed, 30 Sep 1998, Sandy W5TVW wrote:

> I have seen some peculiar looking skeleton "mushrooms" atop towers that have something to do with improved lightning protection.

What you probably saw was an "umbrella" - a capacity hat for top loading. Most AM station towers are far shorter than 1/4 wavelength and need to be loaded. The more "top capacity" you have, the less loading coil needed at the bottom.

The AM station I worked for had a 5 tower array. Each tower's base insulator sat on a concrete pillar. There was a ring of 3" copper strap around the base of each tower, to which were soldered 120 radials of #10 copper wire (buried). To this ring was also connected 4 pieces of the copper strap which came up each of the 4 sides of the pillar and connected to the bottom support plate of the insulator. Between this plate and one leg of the tower was a spark gap made of 2 pieces of 1/2 inch by 2 inch steel, about 6 inches long, spaced at most 1/2 inch apart.

We got hit many times by lightning and never went off the air or suffered any damage. (We also had shorting switches across the RF ammeters at each tower to protect them).

On the other hand, an FM station I worked at had a 275 foot self supporting tower with no radials (allegedly had a buried screen beneath the tower). When we got a lightning hit one time, it came in the lighting circuit and the coax (which came off the tower at 3rd floor level to enter the bldg), took out the tower's top beacon lamps, wiped out 2 air conditioner compressors, blew the connector out the side of a power supply for a Telefunken condenser mic, Blew out the control room monitor speaker, and burned out the Brush crystal headphones I was wearing that were plugged into the audio console. That Telefunken mic had a fire ball hovering over it for a good 15 seconds, yet the built-in preamp was OK. The foil lined insulation in the attic crackled for several minutes - sounded like corn popping.

"Nostalgia is a thing of the past"
E-mail broehrig@admin.aurora.edu 73 de Bob, K9EUI
CIS: Data / Telecom Aurora University, Aurora, IL
630-844-4898 Fax 630-844-5530

Date: Wed, 30 Sep 1998 06:58:36 -0400
From: polepeeg@aa4rm.ba-watch.org (Marty's Refl. Drop)
Message-Id: <199809301058.GAA23602@aa4rm.ba-watch.org>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Grounds, BC industry

I bet a lot of folks here know this story.

And unless I say this now, I'll get an off-topic 'flame.' This is NOT about lightning prot'n.

Back around 1983, three Raleigh, NC area retiree hams did a series of experiments that were published in QST and were so good they were presented at the IRE in Atlanta same year.

They sought to compare the Reinartz elevated counterpoise vs a buried ground system. They built very sensitive induction-current measuring gear that smacked of the Ampro 'claw' hand-helds for AC power use.

Result was "leakage current" into soil markedly affected effectiveness of the ground screen. Reinartz reccomendation of perhaps eight elevated, insulated radials provided as good a "ground image" (other half of the vertical dipole who's center is at the ctp*) as a buried system of many more radials.

Conclusion, use insulated wire like old coax if you must bury your radials.

It took the FCC about a decade to digest this, but now the BC rule is radials every 5 degrees rather than ever 2 degrees.

See, we hams did something!

And Sandy, am I gonna have to wait for another gulf hurricane to hear wind-driven Hartley howl?

Marty

*On the front of the 1929-ish BC188 transmitter, the ground terminal is so marked. Must mean 'counterpoise. I've the complete set & wud love the TM someday.

Date: Wed, 30 Sep 1998 07:13:56 -0400
From: polepeeg@aa4rm.ba-watch.org (Marty's Refl. Drop)
Message-Id: <199809301113.HAA23623@aa4rm.ba-watch.org>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: corrections - Grounds, BC industry

IRE in ~1983 - hah! Geezer @ work. Shudda sed IEEE symposium on Radio engineering or something akin.

Radials ever 5 deg. rather than 2? Shudda sed I THINK that.

M

Date: Wed, 30 Sep 1998 07:39:45 -0400
From: polepeeg@aa4rm.ba-watch.org (Marty's Refl. Drop)
Message-Id: <199809301139.HAA23635@aa4rm.ba-watch.org>
To: Old Tube Radios <boatanchors@theporch.com>
Cc: Boatanchors@theporch.com
Subject: Re: more RS-6 speculation

Hue, I believe someone once opined Andrea (of FADA fame) built it in Mass. & there are folks living that worked in the factory.

W4MEW who then was a Ft. Monmouth man sed the Sig Corps was pissed about the big order that seems to have run to over 10,000.

The things had no known use except in survival sleds in B47s & a few B36s & early B52s.

Looks like they were done as a political favor but no-one has yet said to whom.

The "multi-part design" smacked of the RS-1 & an earlier German spy thing & the final version - the GRC106. This according to popular lore.

TM for the things is devoid of dates & contract numbers.

Ask the man who drives an RS6.*

Marty

*& I've been thru 3 RR6s & believe they're all dead now. Cathode tap on BFO 'greens with age' & falls off. This ends RF to a 1N34 that makes neg. bias for RX & it blocks. I've saved the coils by soldering a strand of #38 to the remaining nub & back it comes. But the RX is very broad with marginal sensitivity & can only be used when no-one else is around. Hence, maybe, the misnomer 'spy radio.'

Then I've never tried 'tweaking one'

And I STILL need the 4 pin blue-molded gold-pinned mini connector for one of the RXs.

I can't resist. What spy would want to take that pile of then-tiny paraphenalia & xtals out on an assignment?

YA KNOW THE 1N34 CAME OUT ~1952 SO THAT MAY DATE 'EM! The cute neg. bias deal in the RR6 is very non-hamish & that's why most "stay dead."

Very interesting they're mentioned in a '57 CQ art'l. I'd like to read it. AND, whazzis "Project Armageddon" thing? Did RS6 use-attempts sack the operation? Hi hi

----

Message-Id: <199809301208.IAA26689@kanga.INS.CWRU.Edu>
Date: Wed, 30 Sep 1998 08:08:00 -0400 (EDT)
From: gcr2@po.CWRU.Edu (George C. Rybicki)
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Ameco Converter?

I picked up a nuvistor converter, model cn. The label only says model cn vhf. how do you tell if its for 6, 2 or 220? Thanks in advance.

Message-Id: <3.0.5.32.19980930072941.007f0e00@mail1.telalink.net>
Date: Wed, 30 Sep 1998 07:29:41 -0600
To: Old Tube Radios <boatanchors@theporch.com>
From: Tom Norris <badger@telalink.net>

```
Subject: US Army Closes ALL public web sites.....
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"



Those of you that frequent the Mil List may notice the US Army links no
longer work. This is the reason........




>Army goes offline in reaction to Pentagon order
>
>                      BY BOB BREWIN (antenna@fcw.com)
>
>                      The Army slammed shut its door to the wired
>                      world last week, closing down all its World Wide
>                      Web sites in reaction to a new Pentagon Web
>                      security policy.
>
>                      Only the Army had such a drastic response to a
>                      Defense Department memo issued last week that
>                      spelled out what information DOD Web sites should
>                      and should not post. The Air Force, the Navy and
>                      the Marine Corps still offer the public access to
>                      popular and highly visible Web pages.
>
>                      The Army's move is in reaction to Deputy Secretary
>                      of Defense John Hamre's policy memo released
>                      Sept. 17, which directed all military organizations
>                      that maintain Web sites to review and then remove
>                      sensitive information that could aid potential enemies
>                      of the United States. Hamre said some Web sites in
>                      the past have provided "too much detail on DOD
>                      capabilities, infrastructure and operational
>                      capabilities.'' Hamre said this new policy will help
>                      DOD to "strike a balance between openness and
>                      sound security.''
>
>                      The Army, according to an internal message furnished
to FCW, responded by
>                      directing all commanders to ensure that "all of their
publicly accessible Web
>                      sites are immediately disconnected from the Internet.''
>
>                      Lt. Gen. William Campbell, the Army's director of
information systems for
```

> command, control, communications and computers, sent the message at 5 p.m. Friday. He added that the shutdown could be accomplished by physically disconnecting Web servers from the public network, moving all Web site files from public to nonpublic servers or instituting control mechanisms that prohibit public access.
>
> The internal Army message also suggested that commands deal with frustrated users trying to access Army Web sites by posting a new "cover page'' (in use on many Army Web pages, including the main site at www.army.mil) that reads: "This Army Web site is not currently available. This Web site will be available again after maintenance is completed.''
>
> The Web shutdown caught the public affairs staff at the Department of the Army's headquarters in the Pentagon by surprise. An Army spokesman was unable to offer any explanation for the move or any indication of when the sites would be operating again.
>

(Originally posted by Bob Margolis on another list.)

Message-Id: <3.0.1.32.19980930145904.007ca620@192.168.0.1>
Date: Wed, 30 Sep 1998 14:59:04 +0200
To: Old Tube Radios <boatanchors@theporch.com>
From: "JOSE V. GAVILA (EB5AGV/EC5AAU)" <eb5agv@ctv.es>
Subject: Re: US Army Closes ALL public web sites.....
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Hi gang!

There is still a 'back door' opened in one of them:

If you try:

http://www.monmouth.army.mil/

or

http://www.monmouth.army.mil/cecom/

you can't access... but try:

http://www.monmouth.army.mil/cecom/lrc/

Hurry up!. They will find it soon ;-)!

Best regards.

JOSE

----
73 EB5AGV / EC5AAU
JOSE V. GAVILA
Ausias March 46, 15
46910 Benetusser - VALENCIA
SPAIN

** VISIT MY VINTAGE RADIO SITE - updated 25-September-1998 ***
http://www.geocities.com/SiliconValley/6992/

Message-ID: <36122E90.5646@lobo.net>
Date: Wed, 30 Sep 1998 07:14:00 -0600
From: "Herbert M. Rosenthal" <herbrose@lobo.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Help ID a Cardwell P/N, please...
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Request help in identifying the following Cardwell split stator transmitting cap:

XF-240-XD

It is about 11-in long, and the spacing eyeballs at .070-.080-in (educated eyeballs), which would make its voltage rating 3000-3500 volts. I measure 30-245pf each section.

It's a beauty-no burns, clean metal.

Anyone building who could use it, not just put it on the shelf... ?

Thanks,

Herb Rosenthal W5AN

From: JONWEINER@aol.com
Message-ID: <b4cbae68.361231ee@aol.com>
Date: Wed, 30 Sep 1998 09:28:14 EDT
To: Old Tube Radios <boatanchors@theporch.com>
Mime-Version: 1.0
Subject: FS: TV-7/A/B/D data
Content-type: text/plain; charset=US-ASCII
Content-transfer-encoding: 7bit

I have for sale a comprehensive set of data for the TV-7 series of tube testers. It is all the military information about the tester, and includes the Technical Manual, Tube Test Data, Tube Data Supplements, Operational Supplement, Field and Depot Maintenance Manual, and the Operator's and Organizational Maintenance Manuals. Over 1" thick, punched for a three ring binder. Price for all: $75., postpaid.

Jon, K1VVC

Message-ID: <36125124.5D7@mr.net>
Date: Wed, 30 Sep 1998 08:41:24 -0700
From: "ROBERT F. KEMP" <rkemp@mr.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Wanted: 3B28's
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Hello all...need a couple of 3B28's for my Valiant.
Anyone have a good pair around! If anyone wants the 866's
let me know.
Bob.

From: JONWEINER@aol.com
Message-ID: <e01fe47a.361234d4@aol.com>
Date: Wed, 30 Sep 1998 09:40:36 EDT
To: Old Tube Radios <boatanchors@theporch.com>
Mime-Version: 1.0
Subject: FS: Collins Literature
Content-type: text/plain; charset=US-ASCII
Content-transfer-encoding: 7bit

I have for sale the complete set of S-Line data used by the military. It includes:Technical Service Manual(s) (dated 7-73 & 11-85) covering the KWM-2A, 30L-1, 30S-1, and accessory equipment, Technical Manual of Circuit Diagrams, Operational Supplement, Safety Supplement, plus all additional supplements. All together, about 1-1/2" thick of original S-Line data. Complete in a heavy duty military binder. Price: $125., postpaid.

Jon, K1VVC

Date: Wed, 30 Sep 1998 10:02:07 -0400
From: "Thomas A. Adams" <103360.2133@compuserve.com>
Subject: Gonset Gooney Bird parts?
To: Old Tube Radios <boatanchors@theporch.com>
Message-ID: <199809301002_MC2-5B1F-CF7E@compuserve.com>
MIME-Version: 1.0
Content-Transfer-Encoding: 7bit
Content-Type: text/plain; charset=us-ascii
Content-Disposition: inline

Greetings, Troops.

Well, Yours Truly went and done it up good at Grayslake / Radio Expo. A gentleman showed up with a pile of disreputable looking Gonset Gooney Bird pieces, asking thirty bucks for the whole pile. Since I had a sick one at home in need of parts, I stupidly bought the whole heap.

Not such a bad move, actually. Since Sunday, I have assembled and restored a 2 metre Communicator II to the living, and managed to do the same for a 6 metre Civil Defense Communicator III.

I have a second CD 6 metre Communicator III about 95% assembled and operating. The only problem is that I've run out of junk! So now the appeal goes out to BA.

Anybody got a junker CD Communicator III for sale? It doesn't matter if it's 6 or 2 metre; I mainly need mechanical stuff and sheet metal to complete this beast. What I mainly need is the following;

---Transmitter PA compartment side panel / shield (the PA likes to oscillate without it).
---Receiver tuning dial scale.
---Knobs... need six of the small ones; already got the large one, and the transmit switch lever knob.
---Rear cover panel.
---Two power cords, or the Jones plugs needed to make 'em; it's a 12 pin Jones plug.

For the Communicator II I need two small knobs, and a rear cover panel.

Also, when I got this pile of stuff, I immediately dived at the pile of three manual copies that came with it. Bit of a problem there, tho...

All three copies were for the 2 metre Communicator III. I don't HAVE a 2 metre Communicator III, or the parts to assemble one. <sigh>

While it was great gangs of fun to get these rigs working without schematics (my instincts must still be pretty good), a 6 metre Commo III and a 2 metre Commo II manual would be a BIG help. Those Gonset receiver subassemblies like to drove me nuts trying to get them working without schematics! <grin>

Actually, after hosing down the cabinets and doing a chassis cleanup and assembly these critters are looking VERY good; I'd rate 'em a 7 or 8 on a scale of 10. The receivers could stand a good realignment job, but they're working pretty well. Transmitters are pumping out a nice, solid 7 watts according to the Bird and dummy, and they modulate quite nicely with a T-17 carbon mike plugged in; modulating well enough to put nice, hairy sound bars into the TV set picture. <grin>   Ah, the joys of TVI...

There were some rigs in the junkpile that were just too battered to resurrect.These closet case, no hope rigs are on the curb, waiting for the garbage man.

BTW...   if anyone out there needs a working 2 metre Communicator III transmitter subassembly, lemme know; I've got a spare. Ditto a Commo III power supply.

73's,

Tom, W9LBB

Date: Wed, 30 Sep 1998 09:12:25 -0500 (EST)
From: "Roberta J. Barmore" <rbarmore@indy.net>
To: Old Tube Radios <boatanchors@theporch.com>
cc: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Ground question
Message-ID: <Pine.SUN.3.96.980930081003.16030A-100000@indy3>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

Hi!

Some more stuff about grounding, with info on the hows and whys in the BD biz:

The "mushroom" gadgets seen on BC towers can be either (or both!) of two things. As someone else mentioned, many AM/BC towers have capacity "top hats." Usually this is done the lazy, easy way, by using part of the top guy wires (look for a wire connecting 'em together at the bottom of the potion used for loading to spot this trick), but sometimes a purpose-built structure is used. It can also be a commercial static-eating widget; I think it's Polyphaser who came up with it but other make 'em, a kind of skeletonized umbrella of pencil-rod type stuff, covered with sharp, sharp points. Theory is, it "shorts out the clouds" before a really big charge can get built up, and the notion does seem to work.

(We have a similar setup on the ~1000' tower at work, in which the lightning rods around the top beacon light have been replaced by billets of metal about 5' long and 4" wide, with *very* sharp knitting-needle sized things protuding on both sides. Called "static cats," we've also got 'em in groups of three (one on each tower leg) at roughly log intervals down the tower. Does it work? It seems to; we never had *huge* lighting problems but I haven't seen any since it went up--some other things probably contribute materially in this, though, as noted below).

I think it was Bob R. who noted the difference in grounding between AM & FM towers. As a general rule, this is the case. For an AM station, the tower is the radiating element and--as with any vertical--you've got to have a realy good RF gound. Thus AMs have got a lot of buried radials. I am not sure about the 2-degree/5-degree issue. I don't know if there'd be lot of difference (and something like copper poultry netting--"chicken wire"--or harware cloth is often found right under the base and for many feet out), but maybe so. The straight-line decrease in "copper density" with distance this scheme provide does *not* model the RF current distribution all that well, it's closer to an inverse-squared decline.

At FM/BC, all the tower does RF-wise is hold the antenna up high so it can see farther; we're pretty much in line-of-sight territory. So grounding is often minimal, and that's a pity. The "typical" regional FM'er has a tower 500' to 1000' high, while AM towers are often shorter. (The 5kW AM I worked for had 440' towers...in a swampy creek valley about 200' below average terrain!)

TV towers, 1000' and up is the rule, unless there's a handy mountain or World Trade Center nearby.

Both FM and TV towers are *wonderful* targets for lightning. In 1957, the lads at Crosley built the station I work for, and they'd seen some things; what they considered adequate was a network of *huge* ground rods (we think 20' long but never dug down far enough to be sure: three per tower leg, with 4-0ish or larger wire to 'em and the rods splayed in an arc with about 10' between 'em, and the same thing tied to the guy wires at the six anchor points. That worked pretty well for years. Many TVs & FMs have far less. (We have far more--the V.P. for Engineering had four 250' *huge* bare copper radials installed, ted to the tower base. Between that, the "static cats" and the original ground set-up, we don't hardly get zapped!)

Now, some notions to ponder: these towers are generally *directly* connected to ground--in the case of AMs, horn or ball gaps are used so that above the flashover voltage they're connected (you set the gaps with 100% modulation at 105% power, btw--not fun!). Then the "building ground," for RF and power, is connected to that point. The most attractive place for a lighting hit to go is *into* *the* *tower* *ground,* not back into the gear. At my installation, there's a "main ground buss" between the electrical service ground and the tower base ground...and the hope is that a big zap on the power lines for which the code ground offers too high an impedance will walk down that path and not go lookin' for trouble. Everything else stars into the the main run. In a perfect world, the power entrance and the tower base would be very close to each other; but it didn't work out that way.

This general sort of thing can be applied to a ham installation, too. Unlike the usual way we wire stuff up--for example, a B+ buss--path and routing is *very* important.

As a general rule for ground conductors--for RF, surface area counts and more is better; for electrical safety, cross-sectional area up to the max current it might ever carry is a good goal (how big's your service? Go at least one size up!); for lighting, both cross-section *and* surface are important, as it's a big, fast transient (we can look at "rise time" as "frequency," which is sloppy but true) carrying a huge lot of current.

For a big, direct "blue moon" strike, anything you can install will be inadequate, so you've got to look at your situation and play the averages better than a Vegas casino. If your antenna structure is not the highest thing close by, you will *probably* dodge the worst of the worst...but the plains-dweller with buried utilities and one lone tower in the back yard is another thing! You do the best job you can afford and physically manage in any case. In my opinion, 2" strap, 1/2" soft-drawn copper tubing, or heavy wire of equal copper diameter will do for most ham installations, especially if the run to your ground rod(s) is short. To get the most bang for your buck, ground rods should be spaced at least the length of the rod apart--otherwise they add up to less. (Close in, they just act like one rod and what's the point?)

On solder in ground wiring: ordinary 60/40 lead-tin solder *can* become heated and make a mess when you do get that big, big strike. That's why a solid mechanical connection is *vital.* You want the joint to be "gas tight," meaning oxygen and worse can't get in and eat at the surfaces in contact. One person suggested in privae e-mail the the rod might be sawn lengthwise and the strap clamped to it with bolts--not a bad idea, though sawing a copper ground rod is probably not done rapidly. Brazing is probably okay (it'd better be--my 1/8" x 4" ground buss at work is bolted and brazed at the joints!). Outdoors and if located where it is not a hazard, I do not think plain soldering would be that big a risk.

In re "fake ground rods," "non-approved hardware," etc.: in most cases, the shack RF/lightning ground is *not* the code or service ground (though it shoude be bonded to it). If you are using the thing as a lightning-rod ground (and it might be so construed), then code or fire regs probabnly do come into play. But for an RF ground, you can bury a '55 Chevy in the dark of the moon if you really wanna, and the electrical inspector can't gripe.
(On that general topic--if you have a roof-mounted vertical and you run a wire down to your ground rod, it might be wise to think of it as a lightning-rod downlead. Have a look at 'em--many are held off the building stricture by flameproof electrical insulators. In a lighting hit, there's a lot of energy--which could make a mess, especially if you live in a wooden house!)

On the counterpoise vs. the buried radial: at RF, the evidence over and over is that a counterpoise works better. RCA's first "ground plane" design had just *one* wire for the plane! Worked FB, too, but the customers thought it was a flimsy, cheap-looking thing, so RCA added another at right angles to make 'em feel better. Other work (cited by other folks in this thread) bears out the counterpoise notion. Combining the counterpoise with a ground rod (in the manner of some commercial ham verticals) is a safety and "can't hurt too much" thing, and not really a bad idea. As Sandy notes, a big vertical conductive widget sticking up into the sky is just darned interesting to atmospheric electricity...so it's nice to give it a place to go that is *not* your home, shack and/or rig!

Got to run, I'm late for work. Sheesh I yap too much.

73,
--Bobbi

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